

March 3, 1887.

Professor G. G. STOKES, D.C.L., President, in the Chair.

The Presents received were laid on the table, and thanks ordered for them.

In pursuance of the Statutes the names of the Candidates recommended for election into the Society were read from the Chair as follows :—

Andrews, Thomas, F.R.S.E.	Kennedy, Professor Alexander
Atkinson, Professor Edmund, Ph.D.	Blackie William, M.I.C.E.
Bottomley, James Thomson, M.A.	Kent, William Saville.
Buchanan, John Young, M.A.	King, George, M.B.
Burbury, Samuel Hawkesley, M.A.	Kirk, Sir John, M.D.
Buzzard, Thomas, M.D.	Landsell, Rev. Henry, D.D.
Cameron, Sir Charles Alexander, M.D.	Latham, Peter Wallwork, M.D.
Carnelley, Prof. Thomas, D.Sc.	Lea, Arthur Sheridan, D.Sc.
Cash, J. Theodore, M.D.	Lodge, Professor Oliver Joseph, D.Sc.
Corfield, Professor William Henry, M.D.	Lyster, George Fosbery, M.I.C.E.
Davis, James William, F.G.S.	Matthey, Edward, F.C.S.
Denton, John Bailey, M.I.C.E.	Maw, George, F.L.S.
Dickinson, William Howship, M.D.	Milne, Professor John, F.G.S.
Douglass, Sir James Nicholas, M.I.C.E.	Ord, William Miller, M.D.
Ewart, Professor J. Cossar, M.D.	Palmer, Henry Spencer, Colonel, R.E.
Ewing, Professor J. A., B.Sc.	Parker, Professor T. Jeffery.
Forbes, Professor George, M.A.	Pedler, Prof. Alexander, F.C.S.
Foster, Professor Sir Balthazar Walter, F.R.C.P.	Pickard-Cambridge, Rev. Octa- vius, M.A.
Gowers, William Richard, M.D.	Pickering, Professor Spencer Um- freville, M.A.
Halliburton, William Dobinson, M.D.	Poynting, Professor John Henry, B.Sc.
Hinde, George Jennings, Ph.D.	Pritchard, Urban, M.D.
Hyde, Henry, Major-General, R.E.	Ramsay, Professor William, Ph.D.
Jervois, Sir William Francis Drummond, Lieut-General, R.E.	Seeböhm, Henry, F.L.S.
	Smith, Willoughby.
	Snelus, George James, F.C.S.
	Sollas, Professor William Johnson, D.Sc.

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Stevenson, Thomas, M.D.	Tomlinson, Herbert, B.A.
Teale, Thomas Pridgin, F.R.C.S.	Topley, William, F.G.S.
Tenison-Woods, Rev. Julian E., M.A.	Ulrich, Professor George Henry Frederic, F.G.S.
Thin, George, M.D.	Walsingham, Thomas, Lord.
Tidy, Professor Charles Meymott, M.B.	Whitaker, William, B.A.
Todd, Charles, M.A.	Yeo, Professor Gerald F., M.D.

The following Papers were read:—

- I. "Preliminary Note on a *Balanoglossus* Larva from the Bahamas." By W. F. R. WELDON, M.A., Fellow of St. John's College, Cambridge. Communicated by Prof. M. FOSTER, Sec. R.S. Received February 15, 1887.

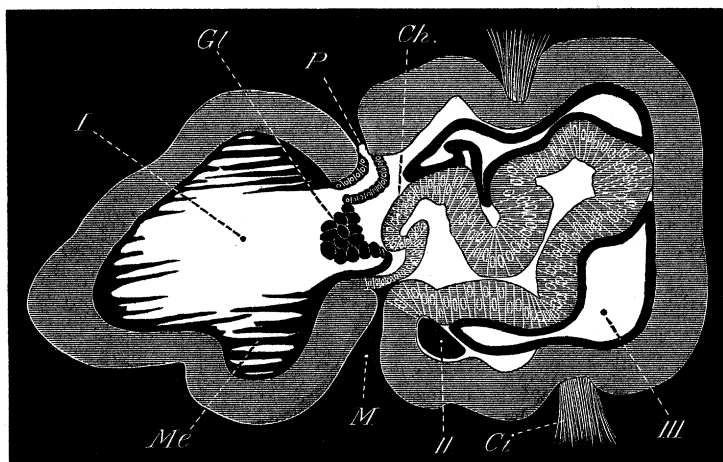
In October last, during a visit to the Island of Bemini, on the western edge of the Bahama bank, an organism was constantly found in the tow-net which closely resembled the larva of *Balanoglossus* recently described by Bateson.*

In the youngest stage observed, this creature has an elongated cylindrical body (about 0·8 mm. long by 0·4 mm. broad) with rounded ends. At the anterior extremity are two eye-spots, while near the posterior is a large and powerful ring of cilia. An anterior region is separated from the rest by a deep transverse groove; more than this cannot be made out by examination of entire specimens.† A little later, a second shallower groove appears behind the first, marking off a smaller middle region of the body from the larger anterior and posterior divisions. An idea of the shape of the body, just before the appearance of the second transverse groove, may be gathered from the nearly median longitudinal section (fig. 1). In this section the mouth is seen to lie in the first transverse groove, on the ventral side of the body; it leads to a well-developed alimentary canal, ending in a median posterior anus, not seen in the figure. On each side of the alimentary canal lie two sections of body cavity; the first (fig. 1, II) can hardly be spoken of as a cavity, its lumen being never conspicuous, and often obliterated; behind this is a well-developed posterior cavity (III). The body cavities of the two sides are separated

* 'Roy. Soc. Proc.,' vol. 38, 1885, p. 23; and 'Quart. Journ. Microsc. Sci.,' 1885 and 1886.

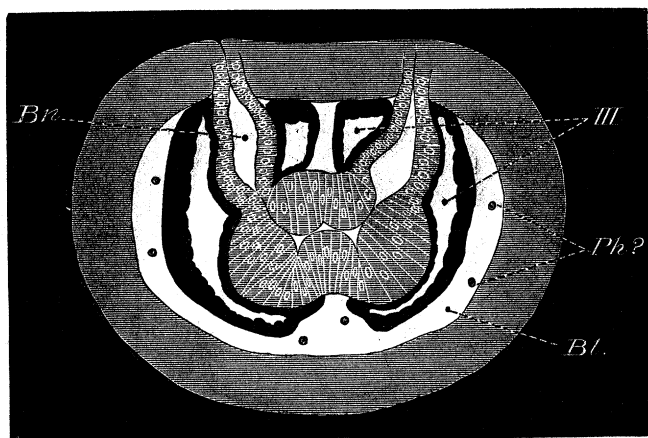
† I regret that my observations on the living larva are most imperfect. Owing to my want of experience in protecting delicate organisms, after capture, from a tropical sun, I was frequently obliged to preserve the material obtained in an open boat, where microscopic work was impossible.

FIG. 1.



from one another in the middle line by a considerable interval, and the posterior pair especially leave a considerable part of the blastocœl unoccupied (fig. 2, *Bl.*). The anterior nearly solid body cavities

FIG. 2.



are separated dorsally by a forward process of the posterior cavities; so that a section so near the middle line as that drawn in fig. 1 does not cut them dorsally at all.

The anterior region of the body in front of the great transverse

groove is occupied by a single unpaired body cavity (fig. 1, I), which obliterates the blastocœl. This cavity is traversed by a number of longitudinal "mesenchymatous" muscles (*Mc.*), and carries on its floor a glandular organ (*Gl.*), near which opens, asymmetrically, a short canal, which runs to the middle dorsal line, where it communicates with the exterior by a pore (*P.*). Immediately beneath the gland is a forwardly directed diverticulum of the gut (*Ch.*).

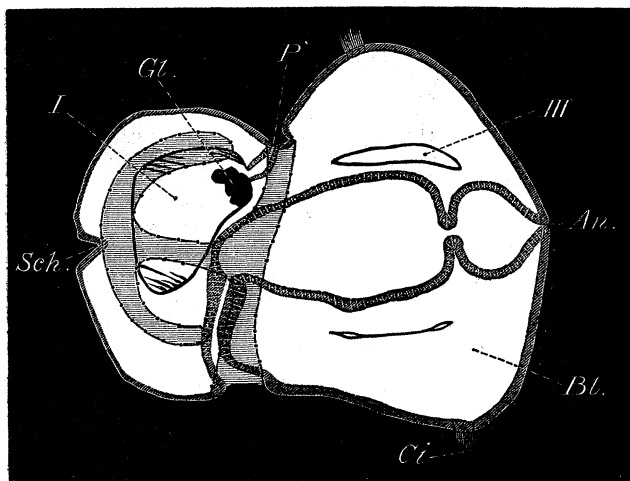
It seems impossible to avoid identifying these structures with the proboscis gland and pore of *Balanoglossus*, and the subjacent "notochord"; while the anterior paired body cavity represents the collar cavity, the posterior the trunk cavity, of the normal *Balanoglossus* larva. A confirmation of this view is given by the appearance, at a slightly later date, of a single pair of rudimentary gills (fig. 2, *Br.*).

The ectoderm of the larva, up to the point at which the gills appear, is very thick (figs. 1 and 2), and contains many mucus and other glandular cells; while beneath the eye-spots is a well-developed "Scheitelplatte," and beneath the general ectoderm a well-formed embryonic nervous system, the details of which I reserve for a later paper.

Just after the development of the gill-slits, there appears to be much variation in the conduct of the larvæ obtained; some exhibit indications of a normal development; the majority, however, begin from this point to undergo a gradual process of degeneration, accompanied by considerable increase in size.

The shape of the most degenerate larva obtained may be gathered from the nearly median longitudinal section (fig. 3); where the collar

FIG. 3.



groove is seen to have disappeared altogether, while that behind the proboscis has become much shallower. The external appearance is complicated by the formation, on each side of the proboscis, of a **M**-shaped groove, the middle limb of which communicates with the post-proboscidian groove, while the margins of all the limbs are provided with short, broad tentacles. The arrangement of this groove is indicated by the shading between dotted lines in fig. 3.

Sections show that the mesoblastic organs have undergone considerable reduction, both relative and, in some cases, absolute. The proboscis cavity is smaller (fig. 3, I); its walls are thinner, and its muscles fewer. The notochord beneath it has quite disappeared; the collar cavities have disappeared; while the trunk cavities are small and thin-walled (fig. 3, III). No trace of gill-pouches remains. The ectoderm is much thinner, and contains hardly a trace of any nervous structure except the much diminished "Scheitelplatte" (*Sch.*), on which the eye-spots still persist.

In connexion with this degeneration of the tissues, it may be noticed that many cells, possibly phagocytes, are present in the blastocoel at earlier stages (fig 2, *Ph.*?).

I was not able during my stay at Bemini to follow this creature further; but at Nassau, New Providence, in the middle of the Bahama bank, I observed, during four months, a similar series of changes in a much larger larva. This larva was first obtained at a period just before the development of the tentacular apparatus, and after the disappearance of the collar groove (if this ever existed). The collar and trunk cavities were both well developed, and the proboscis cavity, with its gland and pore, was as in the youngest Bemini forms. Eye-spots were present, and there was a well-developed cutaneous nerve plexus. In this form degradation was followed to a much fuller extent, till the ectoderm was (except on the well-developed tentacles and beneath the cilia) a mere flattened epithelium; the trunk cavity was a minute solid rod beneath the ciliated ring; the collar cavity disappeared, and the reduction of the proboscis cavity was carried much further than in the Bemini form.

I hope to publish a fuller account of both forms in a subsequent paper. In the meantime, it is submitted that there is fair ground for the belief that the organisms described are *Balanoglossus* larvæ, which from some cause or other have been unable to develop adult characters, and have therefore varied. Independent evidence shows that a probable cause may be the compulsory shifting of the larvæ into deep water by the joint action of currents and winds.*

If this be admitted, four things follow:—*First*, that, at least in some cases, the transmission by a larva of hereditary changes is only

* These larvæ were practically all caught outside the 100-fathom line.

possible on the application of the stimuli afforded by particular surroundings; *secondly*, that some larvæ, in the absence of these stimuli, but in conditions otherwise favourable, are highly variable; *thirdly*, that the variations produced by a given change in the environment may be of an uniform and definite character; and lastly, that these changes may result, not in the modification of ancestral organs, but in the hypertrophy of those which are purely larval.

The last of these considerations leads to the hope that a further investigation of similar cases may afford a criterion by which to interpret larval histories in general.

EXPLANATION OF THE FIGURES.

Fig. 1.—Lateral longitudinal section (nearly median) through a young Bemini larva, just before the appearance of the collar-fold.

Fig. 2.—Transverse section through the trunk of a Bemini larva, at the time of the greatest development of the gill-pouches.

Fig. 3.—Nearly median longitudinal section through a degenerate Bemini larva. The arrangement of the tentaculiferous grooves is indicated by shading within the dotted lines.

Reference Letters.—*An.*, anus; *Bl.*, blastocæl; *Br.*, branchial pouch; *Ch.*, "notochord" of Bateson; *Ci.*, cilia; *Gl.*, proboscis gland; *M.*, mouth; *Mc.*, "mesenchym" of proboscis cavity; *P.*, proboscis pore; *Ph.*?, cells of blastocæl, possibly phagocytes; *Sch.*, "scheitelplatte"; I, II, III, body cavities of proboscis, collar, and trunk respectively.

II. "Studies of some New Micro-organisms obtained from Air."
By G. C. FRANKLAND, and PERCY F. FRANKLAND, Ph.D.,
B.Sc. (Lond.), F.C.S., F.I.C. Communicated by E. RAY
LANKESTER, M.A., F.R.S., Professor of Zoology, University
College, London. Received February 15. 1887.

(Abstract.)

In previous communications to the Royal Society by one of the authors,* details have been given of a number of experiments on the presence of micro-organisms in the atmosphere. In these investigations a solid culture medium was employed, which not only greatly facilitated their enumeration, but also presented them in an *isolated* condition. In this manner the authors have met with a number of

* 1. "The Distribution of Micro-organisms in Air," 'Roy. Soc. Proc.,' vol. 40, p. 509; 2. "A New Method for the Quantitative Estimation of the Micro-organisms present in the Atmosphere," *ibid.*, vol. 41, p. 443; 3. "Further Experiments on the Distribution of Micro-organisms in Air by Hesse's method," *ibid.*, p. 446.

FIG. 1.

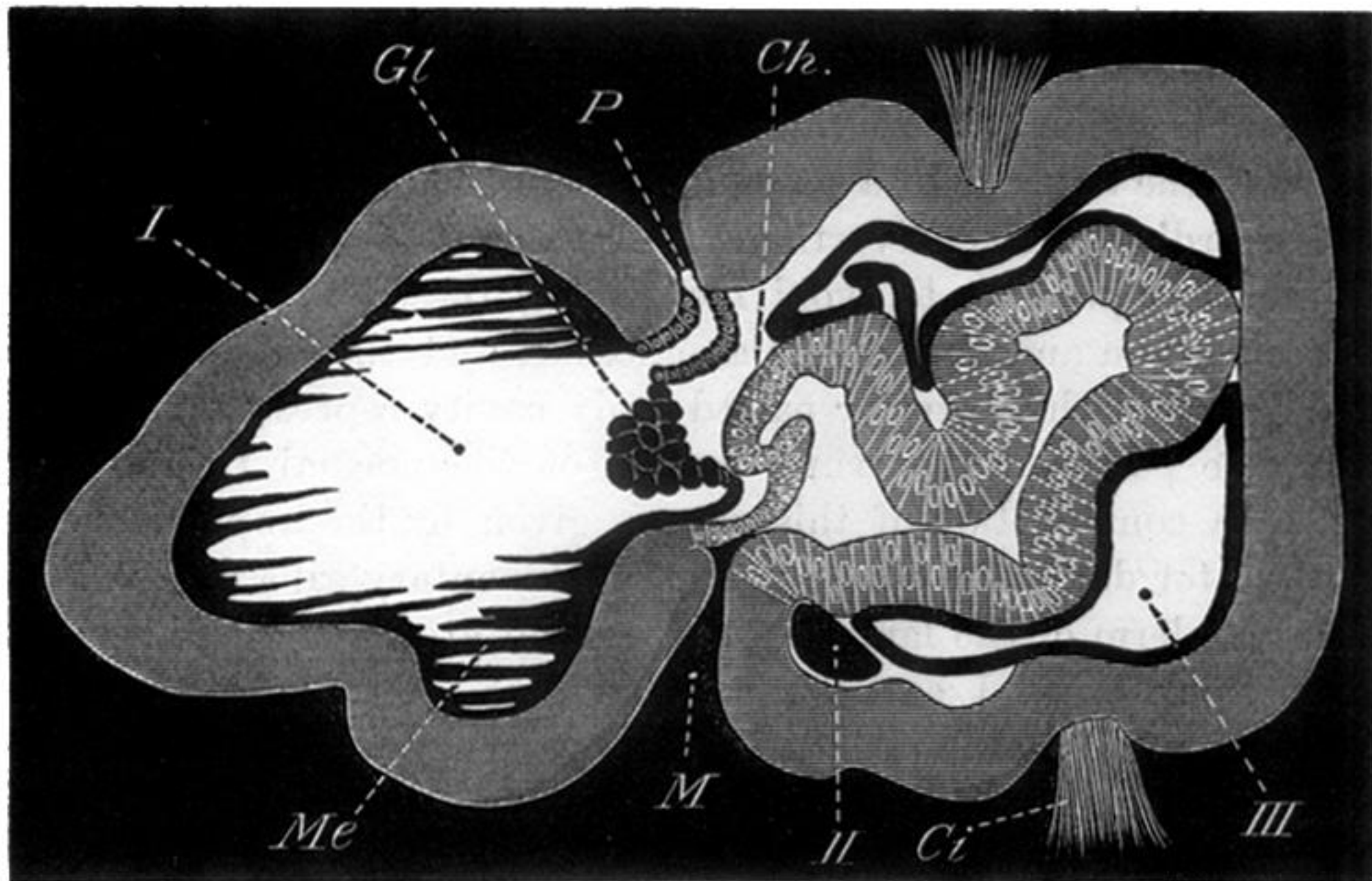


FIG. 2.

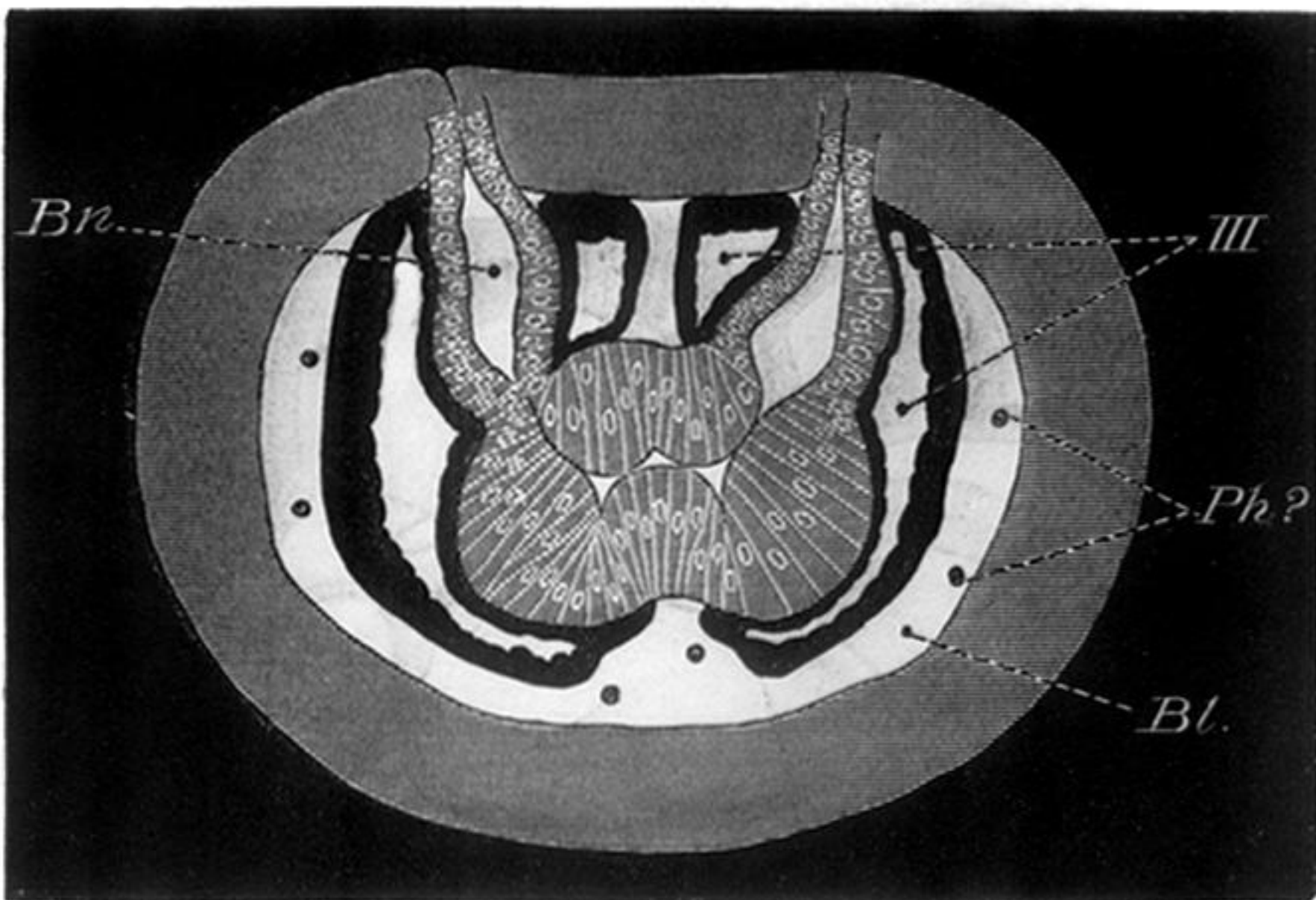


FIG. 3.

